

IN THE CLAIMS:

Please CANCEL claims 1-6, 9-12 and 14-16 without prejudice to or disclaimer of the recited subject matter.

Please ADD new claims 17-26, as follows. Please note that all claims currently pending in this application are reproduced below for the Examiner's convenience.

1-16. (Canceled)

17. (New) A positioning apparatus comprising:

a movable member;

a first pair of electromagnets configured to sandwich said movable member and each to generate suction power having an inverse direction between said movable member and each electromagnet of said first pair of electromagnets; and

a second pair of electromagnets configured to sandwich said movable member and each to generate suction power having an inverse direction between said movable member and each electromagnet of said second pair of electromagnets,

wherein said first and second pair of electromagnets are controlled to generate a driving force in a same direction in order to drive said movable member, and

said first pair of electromagnets is controlled to reduce generation of a leakage flux from said second pair of electromagnets.

18. (New) A positioning apparatus according to claim 17, wherein each of said first pair of electromagnets and said second pair of electromagnets are controlled to generate a magnetic flux having an inverted polarity with respect to the other.

19. (New) A positioning apparatus according to claim 17, wherein said movable member includes an iron core.

20. (New) A positioning apparatus according to claim 17, wherein said movable member includes a core configured with a magnetic material, which forms magnetic paths respectively between said first and second pairs of electromagnets and the core.

21. (New) A positioning apparatus according to claim 17, wherein currents of inverse directions having substantially a same amount are applied to said first and second pair of electromagnets.

22. (New) A positioning apparatus according to claim 17, further comprising a third pair of electromagnets configured to sandwich said movable member and each to generate suction power having an inverse direction between said movable member and each electromagnet of said third pair of electromagnets,

wherein said third pair of electromagnets are controlled to cancel generation of a leakage flux from said first pair of electromagnets and said second pair of electromagnets.

23. (New) A positioning apparatus according to claim 17, wherein said first pair of electromagnets and said second pair of electromagnets comprise a coil and a core, wherein the coil is wound around the core.

24. (New) A positioning apparatus according to claim 17, further comprising a stage configured to be fixed with said movable member and to mount an object to be positioned, wherein said stage is driven in X-axis, Y-axis and Z-axis directions, and a rotational direction around respective axes.

25. (New) A charged-particle beam exposure apparatus comprising:

a charged-particle source for irradiating a charged-particle beam;

a first electron optical system, having a plurality of electron lenses, for forming a plurality of intermediate images of the charged-particle source by the plurality of electron lenses;

a second electron optical system for projecting the plurality of intermediate images, formed by said first electron optical system, onto a substrate; and

a positioning apparatus, holding the substrate, for positioning a stage, said positioning apparatus comprising:

(i) a movable member configured to move the substrate;

(ii) a first pair of electromagnets configured to sandwich said movable member and each to generate suction power having an inverse direction between said movable member and each electromagnet of said first pair of electromagnets; and

(iii) a second pair of electromagnets configured to sandwich said movable member and each to generate suction power having an inverse direction between said movable member and each electromagnet of said second pair of electromagnets, wherein said first and second pairs of electromagnets are controlled to generate a driving force in a same direction in order to drive said movable member, and said first pair of electromagnets is controlled to reduce generation of leakage flux from said second pair of electromagnets.

26. (New) A device manufacturing method comprising:
a step of installing a plurality of semiconductor manufacturing apparatuses including a charged-particle beam exposure apparatus, as defined in claim 25; and
a step of manufacturing a semiconductor device by using the plurality of semiconductor manufacturing apparatuses.